NED

KEN C.

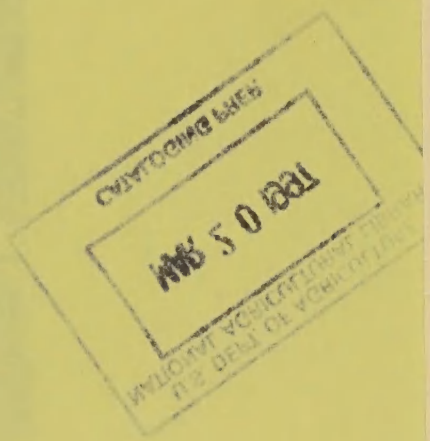
USDA Conservation Incentives Study

STAFF REPORT

NATIONAL ECONOMICS DIVISION

ECONOMIC RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE



USDA Conservation Incentives Study

Robert House
Clayton Ogg
Kenneth Clayton
James Johnson

ERS Staff Report No. AGES820104
National Economics Division
Economic Research Service
Department of Agriculture

January 1982

USDA Conservation Incentives Study, by Robert House, Clayton Ogg, Kenneth Clayton, and James Johnson. National Economics Division, Economic Research Service, U.S. Department of Agriculture, Washington, D.C. January 1982. ERS Staff Report No. AGES820104.

ABSTRACT

A farm level mathematical programming model and its application to the analysis of conservation alternatives are introduced. Farm level data bases are being developed for representative situations in each of the eleven most erosive areas of the United States. Incentive schemes included in the model are those that may be used in implementing provisions of the Agriculture and Food Act of 1981 and in programs designed out of the Resources Conservation Act studies and report. These incentives involve tax credits, cross-compliance proposals, and others. The methodology has been applied to a Nebraska farm with the results of preliminary analyses described in this report. These results demonstrate the potential of this modeling approach for dealing with policy issues in the conservation and commodity program areas. The approach appears particularly useful since it allows comparative analyses of representative farm situations across a variety of geographic areas operating under a diversity of erosion conditions.

Keywords: Resources, conservation, incentives, farm model, mathematical programming, targeting, policy.

Contents

USDA CONSERVATION INCENTIVES STUDY

The USDA Conservation Incentives Study (CIS) is designed to analyze alternative conservation incentives programs. It consists of two distinct, but related activities. One activity is construction of regional farm data bases. A second involves the development of a consistent analytical methodology to evaluate programs using the farm data. Much work has been completed and some analytical results are available from the effort, although more work remains to be done.

This report briefly reviews the purpose of the CIS effort and describes the methodology which is being used. Work that has been accomplished and work that remains are described. Finally, several analyses of conservation incentives and cross-compliance programs are presented.

Evaluating Program Solutions to Conservation Problems

Soil and water conservation have long been important concerns of USDA, but in recent years these concerns have gained more and more prominence in national policy discussions. The conservation problem is widely recognized, but a variety of opinions exist as to the appropriate management practices and policy incentives for best serving agricultural and national interests. In designing new programs or modifying existing programs it is essential that the potential economic effects of proposed changes be carefully analyzed -- including effects they could have on individual farms, rural communities, and the U.S. economy as a whole. Since economic, behavior and physical relationships at the farm level are critical to program effectiveness, farm level analysis must be at the heart of any evaluation of proposed conservation program alternatives. Such analysis considers (1) the farm level impacts of alternative conservation program scenarios and (2) perhaps more importantly,

the performance of alternate program incentive mechanisms with respect to adoption of conservation measures. Farm level analysis must, in particular, identify mechanisms that will target available incentives to those situations most in need of correction.

Typical Farm Analysis Methodology

Farm level analysis capability can be developed which permits farm level conservation analyses and provides for the maintenance of an analytical system that offers rapid turnaround responses to policy issues as required. The CIS analytical system methodology, which involves representative farm linear programming (LP) models, is designed to provide this conservation policy analysis capability.

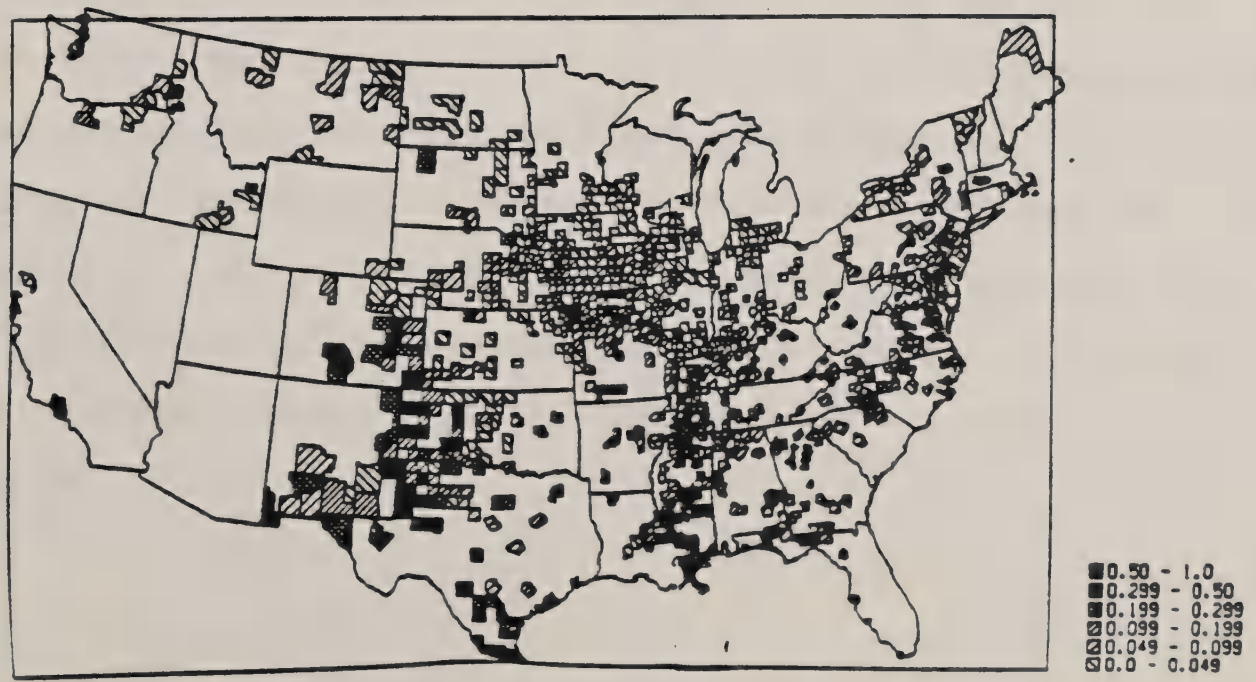
The CIS representative farm methodology provides a good way of organizing a vast amount of conservation management information into a realistic farm model, while remaining flexible enough to permit easy modification and quick turnaround analyses. The CIS project calls for constructing separate farm level models representative of eleven priority conservation areas (see table 1 and figure 1).1/ Each model will contain basic crop and livestock production options relevant to the region. Production activities are specified to include soil conservation management alternatives such as terracing, reduced tillage, residue management, as well as local cropping systems. For any given crop, for example, a set of several production alternatives along the spectrum from least to most erosive practices have been specified. The farm level models also include commodity sales activities, taxation and other

1/ Thusfar, only a prototype model of the Nebraska irrigated corn farm has been completed.

Table 1: Representative Farms for Conservation Policy Analysis

Texas High Plains Cotton Farm
Washington Palouse Winter Wheat Farm
Nebraska Irrigated Corn Farm
Northwest Missippi - Southwest Tennessee Soybeans, Beef Cattle Farm
Florida Panhandle Corn, Soybeans, Beef Cattle Farm
East Central Colorado Winter Wheat Farm
Southwest Iowa Corn, Soybeans, Beef Cattle Farm
Arizona Irrigated Cotton Farm
California (Sacramento Valley) Rice - Grain Farm
Montana Wheat on Fallow Farm
Missouri Beef Cattle, Hog, Corn and Soybean Farm

Figure 1. Proportion of Cropland Acreage Eroding Over 25 Tons Per Acre



financial activities, commodity program alternatives, conservation program alternatives and government program cost accounting. These additional activities allow conservation program analyses to take account of net farm returns and the fact that conservation programs must operate in conjunction with commodity and other government policies.

With this detailed specification the farm models provide a powerful tool for analyzing existing conservation programs, proposed conservation incentive programs, cross-compliance rules tying commodity program participation to conservation requirements, loan guarantees, and programs relying on income tax credits or changes in deduction/depreciation rules.

Scope of the CIS Project

Representative Farm Selection

Eleven representative farm locations (see table 1) were selected for several reasons. First, farm level policy analysis must have adequate regional coverage if it is to be credible. The conservation problems and economic conditions facing midwestern grain farmers are vastly different than those facing, for example, Texas High Plains cotton farmers. A set of farm models which accurately represents eleven major and distinct agricultural environments will allow national level policies to be tested under a variety of local conditions. Programs will be evaluated on the basis of factors such as incentives provided, targeting 2/, and cost effectiveness. A program which performs well in one farming situation may do poorly in another. By analyzing proposed programs under alternative farming situations conclusions that are drawn will be more reliable.

2/ Targeting requires that the incentives be focused on lands with the most severe erosion problems.

The eleven typical farm locations were selected jointly by ERS and SCS. National Resources Inventory (NRI) and ERS Typical Farm Project data were used to select locations which represent the important agricultural areas in the nation where soils are considered highly erosive. This makes them ideal for studying a variety of recommendations of the Resources Conservation Act (RCA), including targeting funds and integrating commodity and conservation programs.

Representative Farm Specification

The goal of the CIS effort is to develop a set of farm models which can provide solid policy and program insights. The models are not intended to be sufficiently detailed to provide farm level management information for individual farmers. In fact, it is important to note that any one of the eleven representative farm models should not be expected to definitively suggest whether farmers in a region should install terraces, or the like, because these decisions include preferences and attitudes unique to each farmer. Farm policy models can be specified with less detail since they are primarily utilized to rank the relative success of alternative policies in achieving national goals. An actual farm management model should be detailed enough to determine absolute costs and returns from all alternative practices. Such models would, of course, serve CIS purposes also, but would be prohibitively expensive to develop, maintain, and utilize.

Specification of a CIS farm model involves a resource inventory and two types of economic information: a) production options and relationships and b) financial and structural formulation. The resource inventory is a profile of the farm land, labor, and equipment resources. The land inventory categories distinguish both by locational decision units (fields) and soil physical characteristics. Currently, the resource inventory data are largely complete for all eleven of the CIS farms.

The production option data are of two types. First, a menu of commodity enterprises which are relevant for the farm in question are specified along with relevant conservation management alternatives for each commodity enterprise. For example, the corn cultivation alternatives might include conventional tillage, reduced tillage, no till, land terracing and contour cultivation. Such comprehensive enterprise data are complete for the Nebraska CIS farm and nearly complete for the Texas, Missouri and Tennessee farms. The second type of production data include all physical inputs and outputs of the production process for each production alternative. This is the most difficult part of the data to secure and involves obtaining and then modifying basic production practice information to account for different conservation management options. In the CIS project, basic production budget data are obtained from SCS field staff, the ERS Firm Enterprise Data System research budgets and other sources. This information is then combined into actual crop production budgets on the SCS Crop Budget System (CBS). The CBS permits convenient storage, presentation and modification of budget data. The crop production data for the Nebraska CIS farm are complete. Partial production budget data have been compiled for the other CIS farms, but not to the stage of placing it on the CBS.

The third type of model information includes a variety of structural and financial data. The CIS LP model is a single period model in which prices and yields are known ahead of time. The progressive federal income tax structure is built into the model and the farmer is assumed to maximize after tax net income. The LP formulation is flexible and general, allowing easy modification of factor and product prices, and of land or other resource availabilities that are crucial to policy decisions. Alternative conservation incentive programs built into the model include cost-share payments, interest

subsidies, soil loss reduction bonus payments, soil loss restrictions, acreage diversion payments, and income tax credit or deduction programs. In addition, commodity program price support activities can be simulated, allowing investigation of cross-compliance programs. The general CIS farm model has been fully formulated and the Nebraska CIS model is completely operational within this system.

CIS Analytical System

The Conservation Incentives Study analytical system consists of much more than a farm model. A generalized farm model structure has been developed which allows for soil and water conservation analysis as well as commodity program policy analysis. Any of the eleven CIS or other representative farms can be analyzed within the context of the general analytical system.

In addition to the single and parameteric LP solution procedures which are used, considerable computer software has been developed to facilitate model construction and analysis. Since substantial crop production enterprise budget data are required, the SCS Crop Budget System has been modified to produce a special machine readable data file of the CIS production budgets. A sophisticated crop enterprise generation system (CEGEN) was developed to read the CBS data and, under control of user specified data inputs, to directly generate the crop enterprise portion of the farm LP tableau. Another program produces a data file directly useable by the LP software which is used for the analysis. These capabilities allow quick and easy generation or modification of CIS farm models from the basic production budget data.

Nearer the analytical end of the process, a report writer program selects and formats important LP solution output information. This facilitates analysis of single and especially multiple model solutions as in the case of parametric price or policy changes.

Conservation Incentives Analysis: The First Four Farms

One objective in having typical farms in each of the more erosive regions is to identify how national policies might better serve the needs of different kinds of farms. Economic impacts of policies can vary widely by principal crop and according to the resources and economic characteristics of farms in each region.

The prototype CIS model is a Nebraska farm in an area with soil and water conservation problems. As an example of the model's capabilities, this report describes how cross compliance regulations and payments to reduce erosion would affect erosion problems on the Nebraska farm. Using the general CIS model and techniques, similar analyses will be pursued for farms in Tennessee, Texas, and Missouri once data are complete. These farms are in areas that account for most of the erosion and sediment damage in the country. After the first four farms are completed, the other seven LP models can be constructed.

The results obtained for Nebraska are offered here as an example of the model's capabilities. However, it should be noted that the value of this approach is in its capacity to compare policy impacts across regions. For example, about one-half of all farmers residing in erosive counties in Missouri participate in commodity programs, while about one-fifth of those in Tennessee participate. From the farm level analysis it may be possible to suggest approaches to conservation incentives and program integration that might better serve the diverse conservation needs of farmers in each of the erosive regions. This will require application of the model to several of the CIS farms.

Conservation Incentives Policy Analysis

The Nebraska Conservation Incentives Study farm model is designed to represent a typical farm in south central Nebraska, an area with substantial

soil erosion problems.3/ The farm consists of 921 acres, about 700 of which is cropland, the rest being range. Corn is the predominant crop grown, with some alfalfa, wheat and soybeans also produced. An 80 cow herd is maintained and the calves are sold as yearlings. In addition, weaned calves are purchased and subsequently sold as feeder calves. The calves graze the crop stalk and stubble residue in addition to feeding on grain.

Crop production alternatives included in the model are numerous. One soil conservation management practice alternative is "conventional tillage" which refers to standard plowing and cultivation operations. "Conservation tillage" refers to reduced soil tillage/disturbance, increased reliance upon chemicals for weed and insect control and maintenance of crop residue cover after harvest (no stubble grazing by livestock). Two cultivation alternatives included were "up and down" slope cultivation, which refers to standard practices, and "contour" farming which adds special emphasis to cross slope cultivation to reduce soil runoff. Terracing refers to construction of earth terraces in order to reduce field slope.

1981 Base Farm Results

The Nebraska CIS farm model was first set up to represent a 1981 base situation. This involves setting product and factor or input prices at their projected 1981 levels. Corn and wheat prices were set at their 1981 target price levels. Several restrictions were specified in order

3/This farm is taken from local SCS files; it represents the actual farm plan of an operating Nebraska farm.

to more accurately represent the farm being modeled. First, the cow herd was required to be maintained at a minimum of 80 head. Second, corn production was required to be at least 70,000 bushels. On this original base farm the unrestricted model solution (no conservation incentive programs or requirements) resulted in soil loss of only 4,802 tons per year or an average of 5.3 tons per acre. A conservation incentives analysis of a farm with so little erosion is not particularly useful. Therefore, the farm base model's distribution of land was adjusted to make it more typical of farms in this highly erosive area (i.e., a greater proportion of erosive lands was presumed).

The 1981 unrestricted base model solution for the adjusted farm (case I) is presented in table 2. Also presented in table 2 is a conservation base model for the adjusted farm which has the additional restriction that no crop production activity resulting in soil loss of more than 5 tons per acre year may be used (case II). Finally, table 2 includes an analysis with both the five ton per acre soil loss limit and a cost-share program where the government covers 75 percent of all conservation investment costs (case III).

In the unrestricted situation (case I) soil loss is 24,745 tons. This may be compared with 2,888 tons in the conservation base model (case II) and 2,791 tons when the cost-share program is in effect (case III). According to the results for cases II and III, to meet production requirements and stay within the 5 ton limit, at least 525 acres must be terraced at a cost of $63,230. Assuming that any terracing cost is financed over ten years at 13.5 percent interest, the annual cost of the terracing investment is $11,887. This is the principal difference in after tax net farm income between cases I and II; i.e., $23,881 for the unrestricted case and $11,853 for the less than 5 ton case. As can be seen in table 2, with the 75 percent government

Table 2: Nebraska CIS 1981 Base Farm Analyses

Type of Simulation:	No Requirements or Incentives Program	Less Than 5 tons per Acre Soil Loss Requirement	Less Than 5 tons Requirement with Cost Share Program 1/
Soil Loss			
Farm Total Soil Loss (tn.)	24,745	2,888	2,791
Farm Average Soil Loss (tn./ac.)	26.9	3.1	3.0
Farm Income			
After Tax Net Farm Income ($)	23,881	11,853	18,795
Conservation Investment Related Expenses and Payments			
Initial Capital Cost($)	—	63,230	68,617
Annual Repayment Cost ($)	—	11,887	3,245
Annual Operation & Maintenance ($)	—	3,162	3,431
Cost Share Program Payments ($)	—	—	51,463
Farm Enterprises and Sales			
Alfalfa (ac.)	15	15	15
Corn (ac.)	607	607	607
Wheat (ac.)	27	—	—
Pasture (ac.)	80	80	80
Soybeans (ac.)	—	—	—
Range (ac.)	192	192	192
Corn Sales(bu.)	67,814	67,814	67,814
Alfalfa Sales (tn.)	—	—	—
Wheat Sales (bu.)	810	—	—
Soybean Sales (bu.)	—	—	—
Cow/Calf (head)	80	80	80
Stocker (head)	384	384	384
Conservation Practices (ac.)3/			
Up and Down Cultivation with Conservation Tillage	32	—	—
Up and Down Cultivation with Conventional Tillage	597	32	32
Terrace and Contour with Conservation Tillage	—	110	110
Terrace and Contour with Conventional Tillage	—	415	460
Contour Farming with Conservation Tillage	—	45	—
Contour Farming with Conventional Tillage	—	—	—
Fallow	—	27	27
None 4/	292	292	292

1/ The government pays 75 percent of conservation investments; the farmer pays 25 percent.
2/ Based on $2.40 per bushel corn price (1981 corn target price); with a $2.35 corn price 1981 base income would be $21,590; at $2.30 it would be $19,236; at $2.25 it would be $16,590; at $2.20 it would be $14,211.
3/ For a description of these practices see page 9.
4/ Pasture, range and land on which no soil conservation practices were specified.

cost-share program the effect on farm income of the five ton limitation is less substantial in case III. The farmer's annual capital cost is reduced to $3,245 and net farm income amounts to $18,795.

These analyses illustrate fairly extreme cases in the spectrum of farm management and soil conservation practices. Given the farm income differences it is clear that substantial incentives may have to be offered to encourage the Nebraska farmer to reduce a loss of 26.9 tons of soil per acre to 3.1 tons per acre. Some possible incentive programs are explored below.

Cross-Compliance Analysis

One possible incentive program would be to require that a farmer meet the five tons per acre soil loss limit in order to qualify for commodity program price supports. To investigate this issue the following question must be addressed: "How far below the target price would the market price of corn have to fall before the farmer would prefer to comply with the 5 ton per acre limit and receive the target price for corn?" To determine how far the market price will have to fall the CIS model was rerun by reducing the price of corn from the $2.40 target price level for 1981 in $0.05 increments.

Farm net income is the pertinent parameter for such a cross-compliance analysis. In a case II situation (i.e., with a 5 ton limit but no cost-share) and with a $2.35 corn price, 1981 net farm income would be $21,590; at $2.30 it would be $19,236; at $2.25 it would be $16,788; at $2.20 it would be $14,211. A farmer's net income would be higher when not participating in the cross compliance program, even if the anticipated corn price fell to $2.20 per bushel. In other words, for the Nebraska representative farm, the benefits of corn price supports would have to be much higher and/or the cost of achieving a soil loss limit would have to be

much lower if such a program was going to influence the farmer's behavior with respect to erosion control. If the cost-share program were included with the cross-compliance program, then a farmer might be expected to participate if the anticipated market price of corn was much below $2.30 per bushel.

Soil Loss Reduction Bonus Program

Conservation incentive programs attempt to encourage adoption of practices which reduce soil loss from the level associated with standard practices. One means of encouragement would be payment of a bonus for every ton of soil loss reduction. The rationale behind such a program would be to provide an economic incentive for farmers to reduce soil loss. Economic returns to most conservation practices are limited in the short term and substantial capital outlay and maintenance costs may be required.

The Nebraska CIS model was used to analyze the farm level effects of bonus payments ranging from to one five dollars per ton of soil loss reduction (see table 3). Soil loss reduction was defined as the difference between achieved soil loss and soil loss under the most erosive standard practices. The results demonstrate possible soil conservation activities that the farmer might be motivated to undertake given the subsidy.

As the subsidy is increased from one to five dollars per ton, net farm income increases $10,167, $21,946, $34,230, $44,894 and $55,272 over the base level. Government bonus payments range from $21,359 to $144,773 over this same set of program alternatives. Average soil loss varies from 10.2 tons per acre with the one dollar per ton program to 2.0 tons per acre with the five dollars per ton program. Bonus payments above five dollars per ton lead to further slight reductions in soil loss.

Table 3: Nebraska CIS Farm: Summary of Soil Loss Reduction Bonus Payment Analyses

Type of Simulation:	No Incentive Program	Bonus Program: Payment Rate per ton of Soil Loss Reduction				
		$1	$2	$3	$4	$5
Soil Loss						
Farm Total Soil Loss (tn.)	24,745	9,418	2,916	2,423	2,423	1,822
Farm Average Soil Loss (tn./ac.)	26.9	10.2	3.2	2.6	2.6	2.0
Farm Income						
After Tax Net Farm Income ($)	23,881	34,048	45,827	58,111	68,775	79,153
Farm Income Increase over Base ($)	—	10,167	21,946	34,230	44,894	55,272
Income Increase per Ton of Soil Loss Reduction ($/tn.)	—	0.48	0.79	1.21	1.58	1.91
Conservation Investment Related Expenses and Payments						
Initial Capital Cost ($)	—	—	49,988	53,840	53,840	67,082
Annual Repayment Cost ($)	—	—	9,398	10,122	10,122	12,611
Annual Operation & Maintenance Cost ($)	—	—	2,500	2,692	2,692	3,355
Incentive Bonus Program Payments ($)	—	21,359	55,721	85,062	113,416	144,773
Conservation Management Practices (ac.)						
Up and Down Cultivation with Conservation Tillage	32	—	—	—	—	—
Up and Down Cultivation with Conventional Tillage	597	—	—	—	—	—
Terrace and Contour with Conservation Tillage	—	—	—	32	32	142
Terrace and Contour with Conventional Tillage	—	—	415	415	415	415
Contour Farming with Conservation Tillage	—	187	187	155	155	45
Contour Farming with Conventional Tillage	—	415	—	—	—	—
Fallow	—	27	27	27	27	27
None 1/	292	292	292	292	292	292

1/ Pasture, range and land on which no soil conservation practices were specified.

The government bonus payment levels seem high, but the actual net farm income increases are considerably less. Soil conservation activities involve: a) capital costs, b) operation and maintenance expenses, and c) opportunity value of activities given up or not undertaken. Further, 20 to 30 percent of the bonus payments are returned to the Treasury depending on the farmer's marginal tax rate. Of course, most of the conservation expenses are deductable from taxable income.

A useful indicator of the economic incentive provided through a bonus payment is the ratio of farm income increase per ton of soil loss reduction. This ratio varies from $0.48 to $1.90 for the Nebraska farm as the program bonus goes from one to five dollars. An assessment of the farm level economic incentive can be useful in policy analysis when several regional representative farm models are in use.4/

Even though soil loss reduction bonus payments as high as four or five dollars per ton are not likely to be seriously considered, the range of model solutions presented in table 3 is quite interesting. This set of solutions depicts the changes in soil conservation management practices which might occur as incentives to conserve soil increase. In the base situation almost 600 acres are in conventional tillage. With only a one

4/ The ratio allows comparison of the nominal program incentive rate (i.e. the one or two dollar bonus per ton) with the "real rate" which reflects the increase in after tax farm net income. Policy makers might decide that any "real rate" of bonus greater than one dollar per ton is excessive. Thus a bonus program with a nominal rate of two dollars or slightly more per ton would be quite acceptable. It is likely that the real rate of return on a soil loss reduction bonus program will be different from region to region. A given program could have differential income distribution impacts across regions. Policy makers can anticipate those differences in order to assure that programs are available which are appropriate to the needs of each area.

dollar per ton bonus program 187 acres are placed in conservation tillage and 415 acres, though still conventionally tilled, are farmed on the contour. When the bonus is increased to two dollars per ton, terraces are constructed on this latter 415 acres. As the bonus increases to even higher levels, more land is gradually shifted into the terracing option.

It is interesting to note that for the Nebraska farm land terracing with conventional tillage remains a strong alternative to straight conservation tillage in spite of the substantial costs of terracing. This is largely due to the strong influence of the livestock cow-calf operation. Putting all of the cropland into conservation tillage would interfere with the cow-calf activities which require a certain amount of crop residue grazing.

These analyses allow comparison of the purely economic differences among conservation practices on the farm being modeled. This is because the incentive or bonus is available for soil conservation, no matter what practices are used to achieve it. This may be contrasted with other programs, which may offer an incentive only for certain types of management practices. For example, programs offering tax credits or accelerated depreciation of capital investments for soil conservation would provide incentive for capital investments such as land terracing, but none for alternatives such as switching to contour farming and elimination of stubble grazing.

Tax Credit and Cost-Share Incentive Programs

Recent proposals from several members of Congress have focused on allowing farmers direct tax credits for soil conservation expenditures as opposed to the current practice of tax deductions. Analyses were run with the Nebraska CIS model to compare tax credit alternatives both with and without a

five ton per acre soil loss maximum and with and without a government cost-share program. The pertinent results of these model runs are presented in table 4.

Before examining these results it is appropriate to discuss the program formulations. The tax credit alternatives examined were a 10, 20 and 30 per cent tax credit for soil conservation investment expenditures, such as land terracing. Credits for acquisition of special conservation tillage machinery were not considered in this analysis, but could be included without difficulty. The cost-share program was specified with the government covering 75 percent of soil conservation investment costs and the farmer covering the remaining 25 percent. Also included in the model as an option was the current law allowing conservation investment expenditures to be deducted from taxable income. The tax credit and cost-share alternatives were run with and without the requirement that no crop production activity may produce more than five tons per acre of soil loss.

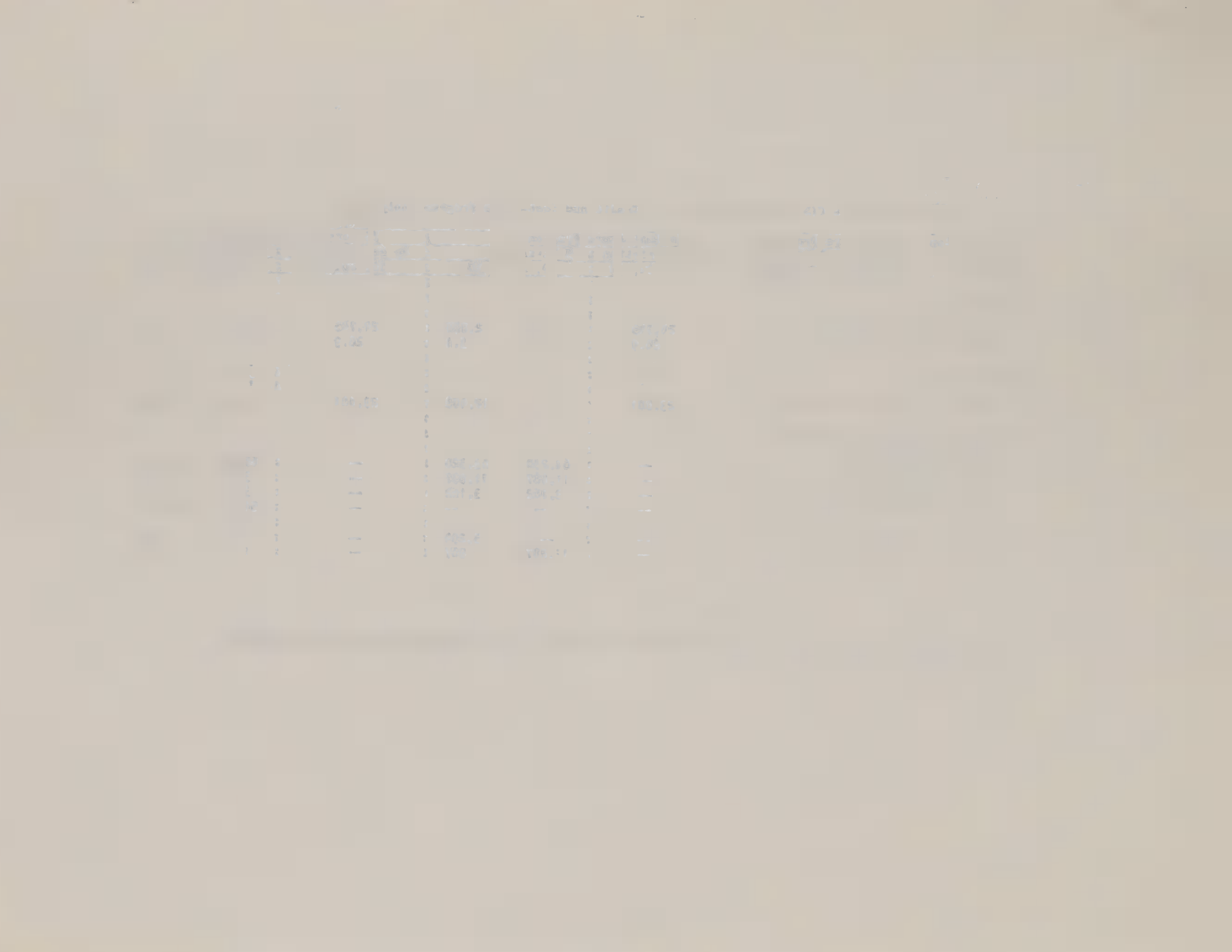
The model analyses were run with all costs and returns on an annual basis. This means, for example, that a 20 percent tax credit was taken only on the annualized cost of the investment (18.8 percent of the total capital cost). This ensures that the tax credit simulations are consistent with the other policy simulations. If by law a tax credit is allowed on the full investment cost (even though it is financed and paid for in subsequent years) the initial year cash position may easily be calculated. We merely need to add to current income the tax credit on the balance of the investment.

One further aspect of these policy analyses deserves comment. The tax credit, tax deduction and, where applicable, the cost-share programs were all included in the model as options. This means that the farm operator was free to choose the program which was financially most

Table 4: Nebraska CIS Farm: Summary of Tax Credit and Cost-Share Program Analyses

Conservation Incentive Programs	Cost-Share Program:	No Cost-Share Program			75 Percent Cost-Share		
	Soil Loss Restriction:	No Restriction	5 Tons/Acre		No Restriction	5 Tons/Acre	
	Tax Credit Program1/:	10, 20, 30	10, 20	30	10, 20, 30	10, 20	30
Soil Loss							
Farm Total Soil Loss (tn.)		24,745	2,888	2,888	24,745	2,791	2,791
Farm Average Soil Loss (tn./ac.)		26.9	3.1	3.1	26.9	3.0	3.0
Farm Income							
After Tax Net Farm Income ($)		23,881	11,853	12,408	23,881	18,795	18,830
Conservation Investment Related Expenses and Payments							
Initial Capital Cost ($)		--	63,230	63,320	--	68,617	68,617
Annual Repayment Cost ($)		--	11,887	11,887	--	3,225	3,225
Annual Operation & Maintenance Cost ($)		--	3,162	3,162	--	3,431	3,431
Cost-Share Program Payments ($)		--	--	--	--	51,642	51,642
Income Tax Credit Claimed ($)		--	--	3,294	--	--	542
Income Tax Deduction Claimed ($)		--	11,887	907	--	3,245	1,420

1/ Figures for the three different soil conservation investment tax credit percentage rate simulations are combined when the results did not differ.



appealing. In actuality, a tax credit program may not allow a choice in taking the covered expenses as either a tax deduction or a credit. Such a program formulation could just as easily have been modeled and analyzed and could have had a significantly different financial outcome. This illustrates the important fact that policies must be precisely specified since subtleties of the specification or even the interpretation of the tax law may strongly influence actual decisions.

Turning now to the results presented in table 4, it can be seen that the financial incentive programs examined were not sufficient to encourage investment in soil conserving capital by themselves. These particular programs affected only the cost to the farmer of terracing investments. It may be that certain non-financial inventives (such as land stewardship) exist which could tip the balance when these financial incentives are present, but such factors are not included in the present analysis.

For those analyses where the less than 5 tons per acre restriction was in effect, the interplay of the three cost reducing strategies -- cost-share, tax credit and tax deduction -- can be seen. When a farmer has a choice between taking a tax credit or a tax deduction the deciding factor is whether the tax credit rate or the marginal income tax rate is greater. If the tax credit rate is higher than the marginal tax rate, then the tax credit is preferred. On the other hand, if the marginal tax rate is greater, then the conservation expense is worth more as a tax deduction. In the Nebraska analyses, the farmer's marginal tax rate is always above 20 percent. Given the current tax rate structure, the marginal tax rate on taxable income above $12,000 is 21 percent or more. Hence, the tax credit program is used only when the credit rate reaches 30 percent.

The tax credit program was used in two of the 30 percent tax credit analyses. In fact, as may be noted in table 4, a combination of tax credit and tax deduction is used in each of the model solutions. This comes about in the following fashion. Initially, the marginal tax rate is above 30 percent. Conservation expenses are claimed as a deduction, reducing taxable income until the marginal tax rate falls below 30 percent. At this point the rest of the conservation expense is claimed under the 30 percent tax credit program.

Opportunities for Further Analyses

The analyses described in this report simply demonstrate the capabilities of the CIS farm model analytical system. A certain amount of effort is required to specify the necessary data for a farm model, but once this is accomplished any number of conservation incentive policies may be compared. Quite different programs (e.g., cost-share versus tax credit) may be compared. Or one specific program with several minor variations in rules or procedures (e.g., standard depreciation tax deductions versus accelerated depreciation deductions) may be analyzed.

In addition to alternative incentive programs the model may be used to study how given programs affect different types of farms. The amount of high erosion potential land in the farm model may be varied. Some of the underlying farm objectives can also be modified. For example, for the analyses of the Nebraska farm described in this report, the farm was set up with quite restrictive assumptions regarding corn production and the size of the cow-calf enterprise. It would be quite easy to change these constraints and to examine the effect that such changes might have on the relative desirability of alternative techniques of soil conservation.

The impacts of changes in external economic conditions may be considered with the farm model. Agricultural product and factor (input) prices may be varied. Interest rates and energy prices would be important to consider

in this regard.

Finally, the interaction of conservation incentive and commodity programs may be considered. This might involve analyses of specific cross-compliance rules, or determination of whether complementary or conflicting incentives are provided by different programs.

As noted previously, the greatest policy value of such analyses rests on their application across a variety of different regional agricultural and economic situations. There does not exist a comprehensive and consistent set of farm models on which conservation incentive programs can be tested, yielding comparable results for several of the more important agricultural regions in the country. Establishing such a farm data and analytical base make the Conservation Incentives Study a most important component of the U.S. Department of Agriculture's effort to deal with the soil conservation issue.